



**BTA**  
BUSINESS TRANSFORMATION AGENCY

# **BMA - Federation Strategy and Roadmap**

## **28 September 2006**

# Version History

Version	Publication Date	Author	Description of Change
1.0	03 August 2006	Federation Team	Initial Release
1.1	05 September 2006	Federation Team	Revised Based on Comments
2.0	28 September 2006	Federation Team	Revised based on Comments from the DoD Community

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# 1. Introduction

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No comprehensive architectural description of the Department of Defense (DoD) Enterprise, including Components and Programs, exists today that can be used to support enterprise-level decision-making. Architectures are developed independently by many organizations across DoD, and they are maintained in independent repositories. This raises several concerns, specifically:

- There is no capability to globally search, vertically or horizontally, for architectures that may be relevant for analysis or for specific architecture development efforts.
- There is no consistent set of standards for architecture configuration management that would enable users to determine the development status, quality, and authority of data in various architectures.
- There is no standard methodology for specifying linkages between architectures which were developed using different tools and are maintained in independent repositories.
- There is no common method to either develop or reuse capabilities described by various architectures.

This document is intended to address these concerns and the need to improve information sharing, gain access to actionable information to support strategic decisions, increase agility necessary to address unforeseen requirements, and decrease cost of DoD architecture and software application development.

To accomplish these goals, the Department has conceived a strategy for a Federated Enterprise Architecture. This architecture is being constructed by federating the separate architectures throughout the DoD. It embodies a set of enterprise services for registering, discovering, and utilizing architecture data to support key DoD decision processes and it incorporate concepts from the DoD Net-Centric Data Strategies.

The principles behind this effort are laid out in the DoD EA Federation Strategy, 2006, which defines federated architecture as:

“...the resultant set of architecture products and data<sup>1</sup> combined from the separate architectures through federation. Federated Architectures conform to common or shared architecture standards across autonomous program areas, domains, etc. enabling developing/owning entities to maintain diversity and uniqueness, while providing interoperability.”

Within this definition, other concepts essential to a federated architecture environment within DoD include:

- **Tiered accountability** - Through the policy of Tiered Accountability (TA), DoD addresses responsibility for the production of architecture at each layer of the Enterprise. As depicted in Figure 1, DoD Federated Architecture, each tier – Enterprise, Component, and Program – has specific goals, as well as responsibilities to the tiers above or below it. Consequently, under TA each existing architecture remains substantially autonomous, yet inherits certain rules, policies, procedures and services from higher-level architectures and provides various services (and imposes roles on) tiers below. In this way, the federation recognizes the need for autonomy but ensures linkages and alignment of architectures from the Program level up to the Enterprise level. It is important to note that, although the federation is depicted as having defined tiers of Enterprise, Component and Program, there are cases where a Component, via Title 10 for example, has the authority to define or oversee enterprise-wide policies, procedures and standards or to own an Enterprise-wide solution. The concept of tiered accountability allows for this scenario
- **Net-Centricity** – A net-centric approach to Federated EA ensures that the Department has an accessible Enterprise Architecture. The March 2005 *National Defense Strategy*, restates the Department’s commitment to making operations net-centric. The foundation for net-centric operations is to have the ability for users to get the information and applications where and when needed. The key enabler of this ability is the DoD Global Information Grid (GIG)

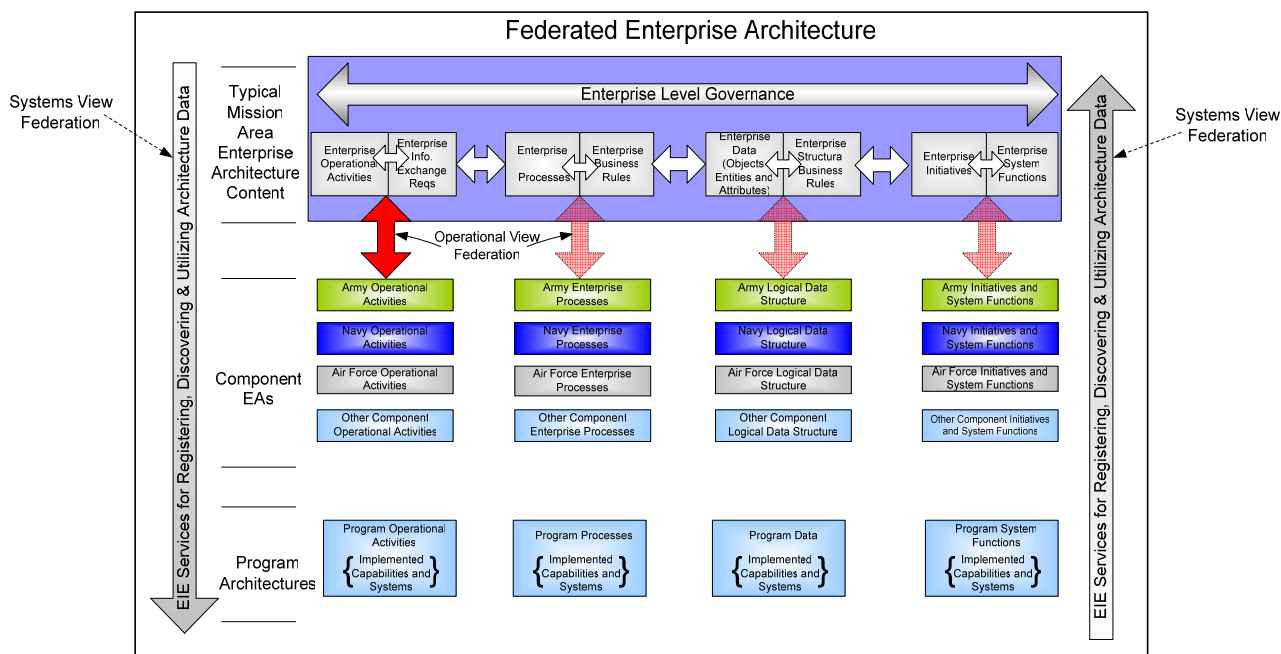
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<sup>1</sup> In this context, data implies architectural data that is not contained within an architectural product. For example, an organization that has identified and defined its operational activities but manages them via Excel Spreadsheet. The rationale for describing it this way is to allow for those organizations without EAs to participate in federation.



which is defined by the Enterprise Information Environment Mission Area (EIEMA) Adherence to GIG policy, including the DoD Net-Centric Data Strategy and the DoD Net-Centric Strategy for Information Assurance are foundational elements for successful federation.

- **Federating DoD Architectures** – To federate architectures means to link or align different architectures via mapping like-architectural information. This concept differs from previous efforts in that it does not advocate a monolithic repository of DoD architectures. Using tiered accountability, each organization is responsible for assessing its alignment to the Enterprise-level architecture. This concept is depicted in Figure 1, DoD Federated Architecture by the red arrows labeled “Operational View Federation”



**Figure 1, DoD Federated Architecture**

## 1.1. The Business Enterprise Architecture's Role Within the DoD Federation Framework

The federated architecture for DoD's Business Mission Area (BMA) begins with the Business Enterprise Architecture (BEA). The BEA has been developed and is evolving to guide Defense business transformation. The BEA is a thin-layer of enterprise architecture centered on the Department's business enterprise priorities. Under Tiered Accountability, it is linked to the business architectures of the various DoD Components and Programs and to the many IT systems supporting DoD business operations. As a component of the overall DoD Federated EA, the BEA inherits and implements numerous DoD-wide rules, policies and procedures from the Global Information Grid (GIG) such as:

- GIG Architecture versions 1.0 & 2.0 (including all associated security policies)
- Net-Centric Operations and Warfare Reference Model (NCOW RM) version 1.1
- The DoD Net-Centric Data Strategy, May 2003.
- The DoD Net-Centric Strategy for Information Assurance

Likewise, each of these rules, policies and procedures, along with all BEA content and associated enterprise business services, is inherited by Component and Program business architectures. By meeting their responsibilities to GIG and BEA rules and policy, Component and Program architectures ensure their interoperability with Departmental information resources. This also improves the Department's ability to provide decision-makers with visibility to the information they require to guide the Department's operations.



## 1.2. Purpose

The purpose of this document is to expand upon the DoD Federated EA Strategy, providing additional detail as to how various aspects of federation will be applied within the BMA. It details specific products, services and capabilities that will be available for BMA users and lays out actions that will be taken to implement federation across the BMA and from tier to tier. Specific areas covered include:

- **Governance:** How the federated approach shall be implemented within the DoD. This includes how business process (and associated business capability, architecture and service delivery) decisions made within the BMA. It also includes the determination of what information is included at each tier of the Department's business architecture. Specifically, this section identifies new responsibilities imposed on the existing business systems governance structures by the needs of federation.
- **Operational View Architecture Federation** – How the various architectures within the BMA will be linked under federation, and, specifically, how new tools and procedures will enable the Department to identify gaps in capability delivery and ensure the compliance to specific business rules, policies and procedures of all Component and Program architectures to the BEA.
- **Systems View Architecture Federation** – How the Department will federate the delivery of business systems and information services by developing a Business Transformation Infrastructure (BTI) to support a Service-Oriented Architecture (SOA) with net-centric principles. This will enable more agile, efficient delivery of IT support for business processes, by employing principles such as Only Handle Information Once (OHIO), minimizing point-to-point interfaces, and eliminating duplication of applications and systems.

Finally, this document outlines specific actions that will be undertaken over the coming year to both implement aspects of federation throughout the BMA and to educate users throughout DoD as to the benefits of BMA Federation and its supporting environment.

## 1.3. Governance

The Defense Business Systems Management Committee (DBSMC), chaired by the Deputy Secretary of Defense, is responsible for the approval and maintenance of the Department's business architecture. This includes updates to the BEA as well as how the BEA integrates with other business architectures across DoD through federation. The DBSMC drives the strategy for business transformation within DoD. In conjunction with the DoD Investment Review Boards (IRBs) and using the methodology outlined in the Business Transformation Guidance (BTG), the DBSMC sets the business priorities of the Department, identifying gaps in business capabilities that need addressing and establishing them as the Business Enterprise Priorities (BEPs) of the Department. The DBSMC also approves recommended solutions to business capability needs and monitors their implementation. In doing so, the DBSMC references information pulled from all layers of the Department's federated business architecture – from the BEA to Program-level architectures.

By establishing the Business Enterprise Priorities, the DBSMC determines where and when specific capabilities are addressed within the federated business architecture. When the DBSMC approves systems delivering capabilities that are not covered by a BEP, their architecture remains at the Component and Program level. The DBSMC may, however, determine that a capability needs to be addressed as an enterprise capability and thus included in the BEA. Component and Program architectures are then adjusted appropriately.

Finally, the DBSMC is responsible, under the FY05 NDAA, for approving IRB certifications of all business system investments over \$1 million over the lifetime of the system. To operationalize this requirement, the DBSMC has charged the Components with conducting BEA compliance assessments of all systems requiring certification prior to submission to the IRBs. The Business Transformation Agency (BTA) has developed guidelines and a dedicated toolset (described herein) to facilitate these assessments.

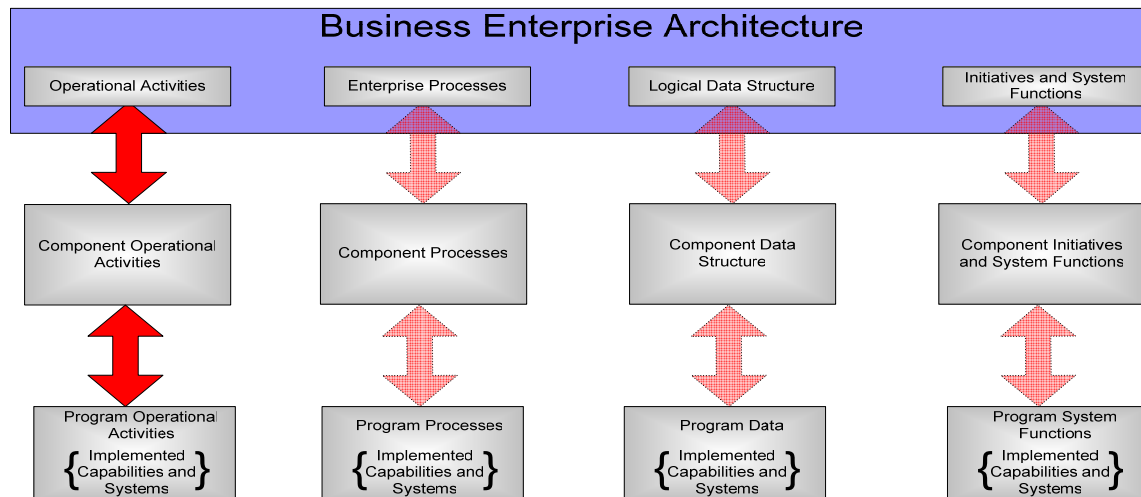
The DBSMC is engaged in all aspects of business systems modernization including plans for moving forward with a Service-Oriented Architecture supporting business systems implementation and modernization.



## 2. Operational View Architecture Federation

### 2.1. Overall Vision for BMA Operational View Federation

Operational View Architecture Federation refers to those services and capabilities that enable linkages or alignment between the various architectures within the BMA, as shown in Figure 2, Operational View Architecture Federation. Gaining visibility across the various business architectures is an essential step in enabling decision-makers to identify gaps in needed business capabilities as well as gaps in delivery of previously identified and architected capability needs. This cross-enterprise visibility also serves as an enabler of portfolio management by allowing all levels of the federation to “see what others are doing” relevant to business capabilities. Within the BMA there is the additional requirement imposed by the FY05 NDAA to assess compliance of all business systems before obligating funds in excess of \$1 million. This requires the additional ability to assess the compliance of program and/or Component architectures with the BEA. These needs are being addressed within the BMA through a variety of means.



**Figure 2, Operational View Architecture Federation**

### 2.2. Federation Repositories

The DoD Federated EA Strategy outlines an approach to establishing a set of federation standards implemented by joining or linking repositories that will enable consistent architecture configuration management of the Department’s data assets as well as discovery and linkage of information contained in disparate architectures. This strategy addresses the Departmental need for providing facilities that allow cataloging, navigation and search across the various DoD architectures. The strategy goes further in outlining a series of Proof-of-Concept Pilot efforts that will begin to demonstrate the utility of this concept and deliver functionality.

This vision is supported within the BMA and participation in selected pilots is encouraged. Given the need to move rapidly in transforming DoD’s business operations, coupled with the NDAA certification requirement, additional tools and processes have been instituted within the BMA to achieve many of these benefits today with existing resources.

### 2.3. Investment Management Framework

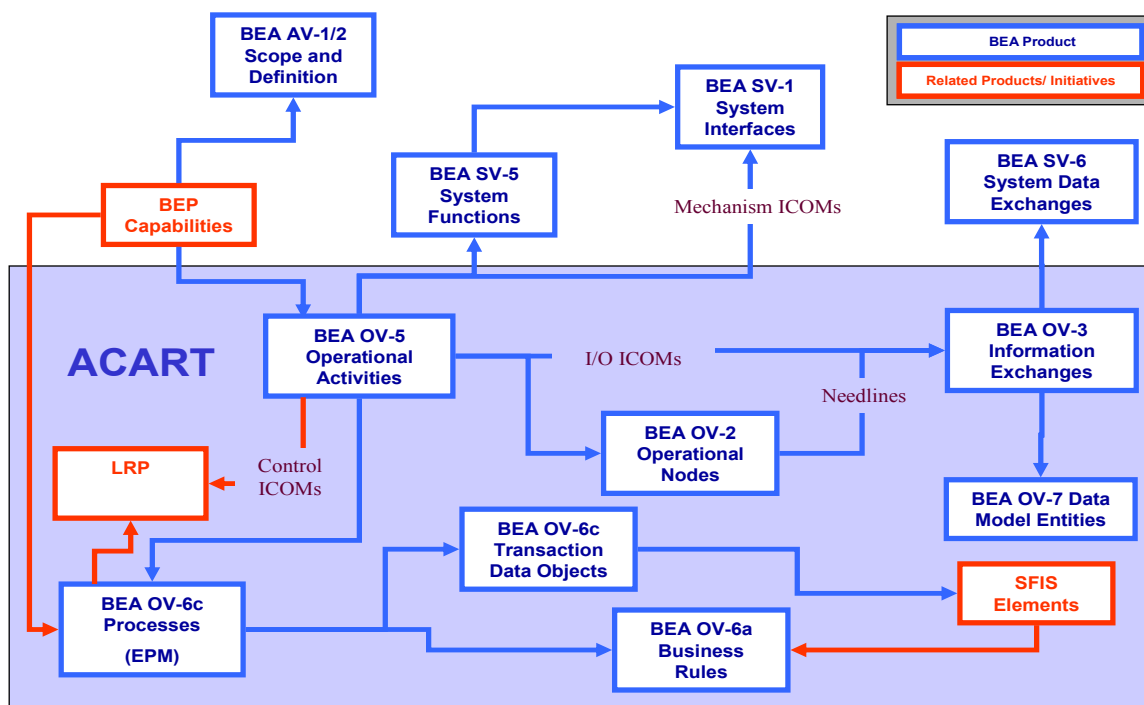
The Investment Management (IM) framework provides a mapping of capability delivery towards meeting Business Enterprise Priority objectives across all tiers of the BMA. Within the Department’s global business systems inventory, each core business system (regardless of where it is architecturally represented) maps to the BEA through its systems functions depicted in the BEA DoDAF SV-5. This mapping is collated across all departmental business systems to visually illustrate how BEP-identified critical business capabilities are being delivered. The IRBs use this information to identify overlaps and gaps in capability delivery in order to properly assess and direct resource allocation within the overall business systems investment.



## 2.4. BEA Compliance – The ACART Tool

As previously stated, the FY05 NDAA requires the Department to certify that business systems seeking investment / modernization funding are compliant with the BEA before funding in excess of \$1 million is released. To assist Components and programs with this assessment, the Business Transformation Agency (BTA) has developed the Architecture Compliance and Requirements Traceability (ACART) tool.

The BEA includes an integrated set of DoD Architecture Framework (DoDAF) products (i.e., All Views (AVs), System views (SVs), Operational Views (OVs) and Technical Views (TVs)). For each operational view, there are corresponding business system assessment areas, such as program controls (requirements), business rules, and standard data elements. This assessment approach is structured to demonstrate alignment of a business system's architecture products to equivalent BEA DoDAF products. Figure 3.0, BEA Product Relationships, graphically depicts relationships among BEA products relevant to federation.



**Figure 3, BEA Product Relationships**

ACART maps to the requirements currently contained within the BEA Compliance Guidance published by the BTA, and is designed to:

- Allow a program to review and select key facets (e.g. Activities, Processes, etc.) of the BEA that it enables or supports<sup>2</sup>. It also automates the filtering of non-applicable parts within each facet;
- Allow saving a historical record of the assessment and mapping;
- Provide for a location to document assertion by a program that the program is compliant with the BEA; and
- Record assertions of support of standards for DoD net-centricity, SOA and data interoperability

As shown in Figure 4, ACART Menu Structure, the ACART menu mirrors the BEA product relationships. Navigation through ACART provides a clear and flexible path for users as they move through the BEA. In the graphic below, the blue boxes represent filtering mechanisms, and the green boxes represent assertion mechanisms. Specifically:

<sup>2</sup> Appendix D provides an example of how one should use the activities of the BEA OV-5 Node Tree to demonstrate Component/Program mapping to BEA activities.

- Activities filter information exchanges (IERs) and Business Processes;
- Information exchanges filter data entities;
- Business processes filter Laws, Regulations and Policies (LRPs), process-related business rules, and data objects;
- Data objects filter data-related business rules and interoperability checklists

<b>Activities</b>	<b>Information Exchanges</b>	<b>Data Entities</b>		
	<b>Processes</b>	<b>Laws, Regulations, and Policies (LRP)</b>		
		<b>Process-Related Business Rules</b>		
		<b>Data Objects</b>	<b>Data Elements</b>	<b>Data-Related Business Rules</b>
				<b>Interoperability Checklists</b>

**Figure 4, ACART Menu Structure**

ACART steps the user through a complete set of architecture and standards documentation with a series of pop-up screens. Users can work within ACART, export to Excel, Word or XML-based text, or print standard reports. For more information on ACART Capabilities refer to the ACART Application User Guide.

The result of using ACART<sup>3</sup> is more effective and efficient use of BEA architecture information improving the architecture certification process and architecture alignment. Improved architecture alignment will, over time, improve the quality of the federation of DoD architectures.

## 2.5. Capabilities Not Covered by the BEA

Both the IM Framework and the BEA Compliance methodology are constrained by the content contained in the BEA which, at this time, focuses solely on the Department's Business Enterprise Priorities. Systems and Initiatives delivering capabilities that are not incorporated within the Business Enterprise Priorities are not covered within either of these processes. In many cases, such systems are reviewed and approved by the IRBs and DBSMC based on a review of their stand-alone architectures. This is so because no consistent capability or level of architectural detail currently exists to enable review of these systems in context with similar systems based on a look across their architectures. Therefore, they do not currently fall within the federation framework.

Components with systems that deliver capabilities that currently are not represented in the BEA but fall within the scope of the BMA are viewed as providing new requirements to the BEA and will be considered for future versions. It is important to note that, to be considered for a future version of the architecture, capabilities must be deemed as priorities by the PSAs and those priorities pushed to the Business Enterprise Priorities for inclusion in the BEA. This process is described further in the BTG. Additionally, the establishment of federating architecture repositories will provide important cataloging, navigation and search services (essential to Operational View Federation) for all participating business architectures, including those with capabilities that are not in the current release of the BEA. Federation solutions that take into account all business capability needs of the Department will continue to be explored within the BMA. See Appendix D for an example of how a Program, with activities that lie outside the scope of the current BEA, gets included in the Federated Enterprise Architecture.

<sup>3</sup> Currently, the use of ACART is not mandatory but, some Programs and Components are using the tool to assist in assessing BEA compliance (e.g., Defense Logistics Agency, BTA, Defense Enterprise Accounting and Management System, Defense Agencies Initiative)

## 3. Systems View Architecture Federation

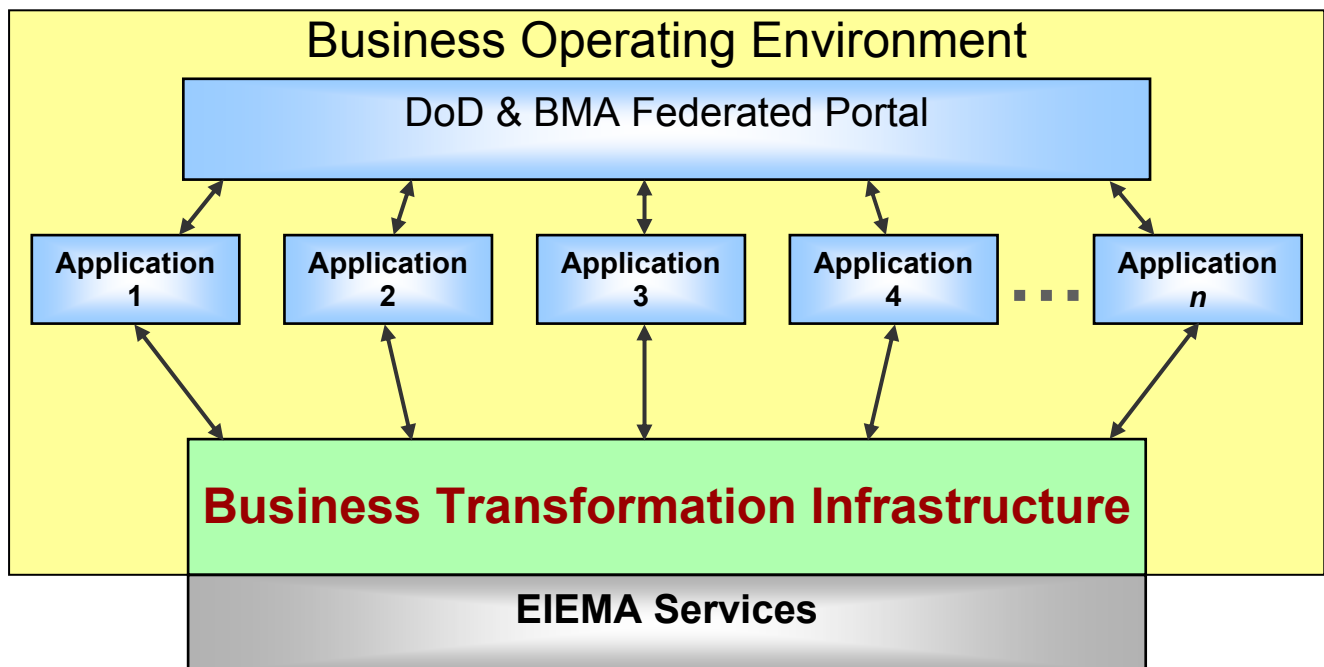
### 3.1. Overall Vision for BMA Systems View Federation

This section discusses the infrastructure needed for federated systems and operations within the BMA. Federation at the Systems-View level is the application of principles, standards, services and infrastructure to create interoperable execution of enterprise and Component business systems. This will be accomplished through the delivery of software applications (Services) within a Service-Oriented Architecture (SOA). SOA allows the “piecing together” of functionality and data from almost any application into services and orchestrating these services as an automated business process.

Central to this delivery of an SOA is the development of a Business Transformation Infrastructure (BTI) which will enable the interconnection and interoperability of BMA systems and applications. The BTI, with its application federation mechanisms, is the Systems View mechanism that contributes to the achievement of information visibility. It interconnects BMA applications and systems, using the wider DoD infrastructure provided by DoD’s Global Information Grid (GIG). The BTI is the BMA’s set of unique common information technology services needed for the realization of the prioritized Business Capability improvements in the DoD Net-Centric Environment.

The overall IT ecosystem of the BMA is the Business Operating Environment (BOE) which comprises metadata, applications, systems, a unifying Portal and the BTI. The place of the BTI in this overall ecosystem (the BOE), is shown in Figure 5, Vision for the Business Transformation Infrastructure (BTI) in Context. The BTI assists in eliminating applications as islands or stovepipes, connected by a myriad of special arrangements and custom interfaces. Systems View Federation is achieved when the BOE is populated with interconnected systems exchanging data via the BTI. As shown in Figure 5, Vision for the Business Transformation Infrastructure (BTI) in Context, the BTI builds on the Enterprise Information Environment Mission Area (EIEMA) capabilities, providing value-added services focused on the BMA, including:

- Providing the BMA with common services that can and should be shared by the members of the BMA, and
- Providing infrastructure services called for as part of the DOD EIEMA Core Enterprise Services (CES), but not yet available.



**Figure 5, Vision for the Business Transformation Infrastructure (BTI) in Context**

The BTI and its supporting organization within the Business Transformation Agency (BTA) will identify the open standards to be used, and loosely coupled interconnected and interoperable business services, following the tenets of net-centricity. This infrastructure will enable interoperation and interconnection of business systems and applications<sup>4</sup> when they need to exchange information, expose functionality, or consume information. The BTI provides the standards, policies and technical infrastructure needed to share BMA services with the other DoD Mission Areas according to DoD CIO policy and guidance.

As stated earlier, federation at the Systems-View level is intended to create interoperable execution of enterprise and Component business systems in the BMA. This is accomplished while complying with and leveraging the GIG and other Government standards and models for interoperable architectures. Actual systems and application federation is achieved when the BMA systems connect to infrastructure capabilities provided within the BTI, or by the EIEMA following the designated standards. Examples are validation of electronic funds transfer (EFT) account data from the authoritative sources in personnel and use of the enterprise credential validation service to validate users.

## 3.2. BTI Guiding Principles

The BTI and systems-level federation are guided by principles formulated to keep BMA and EIEMA-based federation aligned with the net-centric guidance of DoD while providing necessary support for business transformation. These principles are:

- **Incorporation of Information Assurance (IA):** The development of the BTI will incorporate and address the requirements for Information Assurance as an integral part of the infrastructure. These IA requirements will be implemented in conformance with appropriate standards and directives, including DoDD 8500.1.
- **Adherence to Standards:** There are two sets of standards needed for systems federation via the BTI: standards required for the stand up of the BTI and standards to be used for communication by applications that will connect with the BTI.

The first set of standards needed for the implementation of the BTI include, at a minimum, those set forth in DISA Memorandum by the Chief Technology Officer, "Proposed Standards for Implementing GIG Enterprise Services" of December 27, 2005. These standards, including the web services standards stack, have been registered in the Defense Information Standards Registry (DISR) – see DISRonline, and mandated for new applications as well as enumerated in the BEA 4.0 Technical View product.

The second set of required standards covers the content passed across the BTI as messages and transactions. The BTI will define a set of standard message sets based upon standard protocols that are used by applications that are plugged into the BTI. As BTA collaboratively develops and adopts these standards, they will be included in the BEA Technical View products, with an initial list in BEA version 4.0. Standard message sets and Extensible Markup Language (XML) schemas for representing information available through services in the BTI are keys to achieving information visibility and data interoperability. This implies no modification to the SOAP standards, but the definition of standard business content (i.e., the payloads of the messages).

- **Data Visibility, Accessibility, and Understandability to Support Decision Makers:** By implementing the DoD Net-Centric Data Strategy (DoD Directive 8320.2), the BMA enables authorized users in the Department to find, reuse, and understand BMA data and services. The BMA/BTI and EIEMA capabilities provide participants with protocols and standards for information sharing. This ensures participants are in semantic agreement (i.e. the meaning behind the data to be shared is understood). When needed, mediation infrastructure in the BTI can provide units a reasonable path to providing information consistent with the enterprise semantics. The BTI will also provide discovery metadata to enable leadership to rapidly find information needed to support decision making.
- **Service-Oriented Architecture (SOA) Delivering Loosely Coupled Services:** The BTI will enable the creation of BMA services for the DoD SOA providing value-added services built on EIEMA provided capabilities. As

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<sup>4</sup> In this context, an application can also be a service or Component.





described by the SOA, the Business Mission Area will become a “suite” of services and applications, with implemented cross-enterprise business processes.

- **Authoritative Sources of Trusted Data:** The BTI provides metadata catalogs for BMA data producers to register their data sources and increase their visibility, while providing consumers a way to find authoritative data sources. Consumers of data must be able to trust and have confidence in the information available to them from other members. Designating and describing authoritative sources provides the data consumer with guidance to assess information sources and determine their appropriate use for the task at hand.
- **Metadata-Driven Framework for Separation from Technical Details:** The BMA/BTI and EIEMA provide a metadata-driven approach for locating, accessing, and understanding data assets and services. This allows users of the environment to be separated from technical details by allowing consumers and services to query metadata as needed. This approach leverages both the Capabilities and the services provided by the BTI or those to be provided by the NCES, such as search, discovery and enterprise registries.
- **Vendor Neutral, Open Standards:** The BTI will be built with vendor neutral, open standards to provide an enterprise-wide ability to choose best-of-breed solutions for implementing Business Capabilities. The BTI will be built with components that support and use web Services standards as outlined in the BEA Technical View-1 product and the Net Centric Operations & Warfare Reference Model Target Technical View (NCOW RM TTV).
- **Support Use of Open Source Software:** Open source software has emerged as a viable source for off-the-shelf capability, particularly for middleware and infrastructure such as servers. The BTA will consider open source software solutions on an equal footing with regular commercial offerings, with due consideration given to support and proven reliability. This will allow DoD to realize benefits in cost and source availability that can come from open source software.
- **Emphasize Use of Service-Enabled Commercial Off-the-Shelf (COTS) Software:** Commercial software is moving in the direction of providing component-based, service-oriented software applications designed to participate in a Service-Oriented Architecture. Commercial tools allow the provisioning of existing or legacy applications for participation in a SOA. The BTI will support this movement to SOA and encourage acquisitions appropriate to SOA creation within the policies and standards outlined as part of the BTI.
- **Participation in the DoD Enterprise:** It is a principle of our approach that the BMA must integrate, collaborate and coordinate with the wider DoD enterprise initiatives. The BMA is a member of the larger DoD Enterprise and a provider of capabilities to the GIG. The BTI builds on the EIEMA CES to provide value-added services focused on the BMA. The BMA/BTI and EIEMA capabilities provide the services for enabling the interconnection and interoperability of BMA systems and applications regardless of level (Enterprise, Component, or Program).
- **Support Mobility - Users & Devices:** As appropriate, BTI technology should support a wide range of devices being used by a highly mobile and intermittently-connected user community — from cell phones to Personal Digital Assistants (PDAs) to tablet and notebook Personal Computers (PCs), and should support emerging wide area wireless standards and connectivity in a secure and controlled fashion.

### 3.3. The BTI and the Core Enterprise Services (CES)

The foundation of the BTI is the CES and NCES Capabilities Development Document Product Lines of the GIG. As an integral part of the GIG, the BTI is dependent on other elements of the GIG to achieve the goals for interconnection and interoperation. The methodology for achieving service use within the BMA is based on creating and operating the value-added services of the BTI as an SOA infrastructure that does not duplicate or re-invent the infrastructure and services provided by EIEMA.

The BTI complements the GIG in situations such as:

- **Creating Mission Area Value Added Services:** GIG services may be accessed directly by systems, or may be mediated and presented to business systems through the BTI middleware. For example, the GIG provides some capability through the IA/Security Core Enterprise Service, and the BTI will also provide some portion of the IA capability, as extensions needed by the BMA. Business services can be built without directly addressing security, and declaratively “decorated” with security requirements metadata at deployment time. Using metadata defined in the BTI, the BTI will seamlessly intercept the flow of invocation and response between a service consumer and the service in order to provide the necessary security controls.



- **Providing BMA with Shared Services Not Provided by the CES:** There is a need for common services, specific to the Business Mission Area that will be provided by the BTI (e.g., XML XSLT Transformation, High-Volume Transformation, Business activity Monitoring).. This will better allow the interoperability and interconnection of business systems, as well as rapid development of new capabilities. This will solidify their net-centric foundation and further enable information visibility.
- **Core Enterprise Services Not Yet Available:** EIEMA is planning to release its Core Enterprise Services in a phased approach. Should the BMA need these services before the EIEMA has implemented them, the BMA can construct a place-holder implementation for use by BMA applications. When the EIEMA services become available, the BTI can be changed to direct invocations to the EIEMA services. BMA applications using these services through the BTI interfaces will not need to be changed or have their operations interrupted.

### 3.4. Rights and Responsibilities of BMA Participants

Successful SOA implementation is possible only when participants from across the tiers of the BMA who are responsible for services, applications and systems operations have clearly defined rights and responsibilities. The rights and responsibilities herein are designed to be complementary to ensure the autonomous operation of Components and programs where needed, and more efficient enterprise business processes and operations across the BMA.

BMA Tier	Rights	Responsibilities
Enterprise	<ul style="list-style-type: none"> <li>• Impose constraints on Components and programs in order to achieve cross-BMA interoperability</li> <li>• Prioritize Business Capabilities</li> </ul>	<ul style="list-style-type: none"> <li>• Define the protocols and standards for connecting to BMA/BTI and EIEMA capabilities</li> <li>• Make the BTI infrastructure available to the BMA</li> </ul>
Component	<ul style="list-style-type: none"> <li>• Impose constraints on programs within the Component as deemed necessary by the Component</li> <li>• Where not constrained by the enterprise, autonomously manage architecture and technology standards and adhere to the requirements established in the enterprise architectures</li> </ul>	<ul style="list-style-type: none"> <li>• Support Component implementations consistent with BMA/BTI and EIEMA guidance, protocols and standards</li> </ul>
Program	<ul style="list-style-type: none"> <li>• Where not constrained by the enterprise or Component, autonomously manage architecture and technology standards and adhere to the requirements established in the enterprise architectures</li> </ul>	<ul style="list-style-type: none"> <li>• Use BMA/BTI and EIEMA guidance, protocols and standards so that local infrastructure interoperates with the BTI and EIEMA</li> </ul>

**Table 1, BTI Participant Tiers' Rights and Responsibilities**

### 3.5. Systems Federation Support Across the Lifecycle

The BTI will provide facilities to support systems and users across the full system development lifecycle from design and development, to deployment and installation, and to ongoing production operation. The following subsections describe how users at different stages of the lifecycle may make use of the BTI to achieve interoperability for the BMA.

#### 3.5.1. Design Time

Designers and developers can access the service and metadata registries and repositories provided by EIEMA and the BTI on the GIG. This will allow them to determine the availability of facilities that can be leveraged in their applications. These EIEMA and BTI facilities also allow designers and developers to obtain the correct rules of engagement, parameters, data and document definitions for constructing the bindings of their applications to EIEMA and BTI





services and other registered application services across the BMA regardless of level (enterprise, Component, or program).

Web Services advocates envision the ultimate use of registries and metadata to support;

- the dynamic binding of applications to the services they need,
- discovering these services, and
- constructing appropriate invocations of the services from the metadata found in the repositories at run time.

It is important that the BTI and EIEMA support designers and developers in the area of service and metadata registries and repositories. It is also the case that other services directed at the development community will be provided in the BTI as part of the BMA-unique common services. This is important to enable the BMA to meet both DoD's and BMA's goals for Net-Centricity and SOA.

### ***3.5.2. Deployment Time***

It is becoming more common to construct applications that do not have all their behavior and connections to their runtime environment established at development time. Such applications are configured at installation or deployment time by “decorating” the application with appropriate metadata. This metadata may include:

- the locations of specific service implementations that the deployed application will use,
- policies that the application will follow during execution, and
- providing or pointing to specific business rules that the application will enforce.

Deployment users will access the service and metadata registries of EIEMA and the BMA/BTI on the GIG as part of the planning process for deployment. They will gather the specific information which is needed to “decorate” the installation. Such information is typically provided in the form of XML files that the application reads to configure itself, and guide its execution.

### ***3.5.3. Run Time***

Major support for applications by EIEMA and the BMA/BTI comes at runtime, when applications are executing. EIEMA and the BMA/BTI provide the messaging and brokering facilities that interconnect the applications and enable interoperation of independently developed applications. It provides standard message definitions for use in communications, and can also be used by applications in performing data edits and validation. Additionally, the BTI provides access to services from other applications and a wide range of common services that range from mediation services to common business services as described in the next section. It provides the means by which services can be brought together across applications to support and execute business processes through its service orchestration facilities. Lastly, EIEMA and the BMA/BTI provide the means to monitor the activity of the business through the event-driven architectural facilities of the BTI. All together, these facilities ensure a business application environment that is robust, interoperable and rapidly adaptive thus accommodating changing requirements and regulations.

## **3.6. Structure of the BOE and BTI**

It has been shown that the BMA strategy for Systems View federation is based on developing a Service-Oriented Architecture (SOA) for the Business Mission Area that is supported by a common enabling and empowering infrastructure, the BTI. SOA defines loosely-coupled, component-based architectures in which the relationship and interoperation between components is governed by well-defined contracts known as interfaces. These interfaces are defined independently of specific implementations and may be provided in more than one implementation — that is, a particular defined service may have more than one provider, but each provider will meet the contract of the defined interface. This quality is what promotes and supports use across the enterprise implementation of such architecture. The services in a SOA are technical constructs intended for machine or computer software consumption and should not be confused with the services that are functional and capability offerings to the users of BMA systems and applications. The latter services are indeed very important but can and are made available to users independently of whether or not the systems have been built with a SOA. Service Level Agreements (SLA) contain the terms and conditions governing the use of these kinds of services.

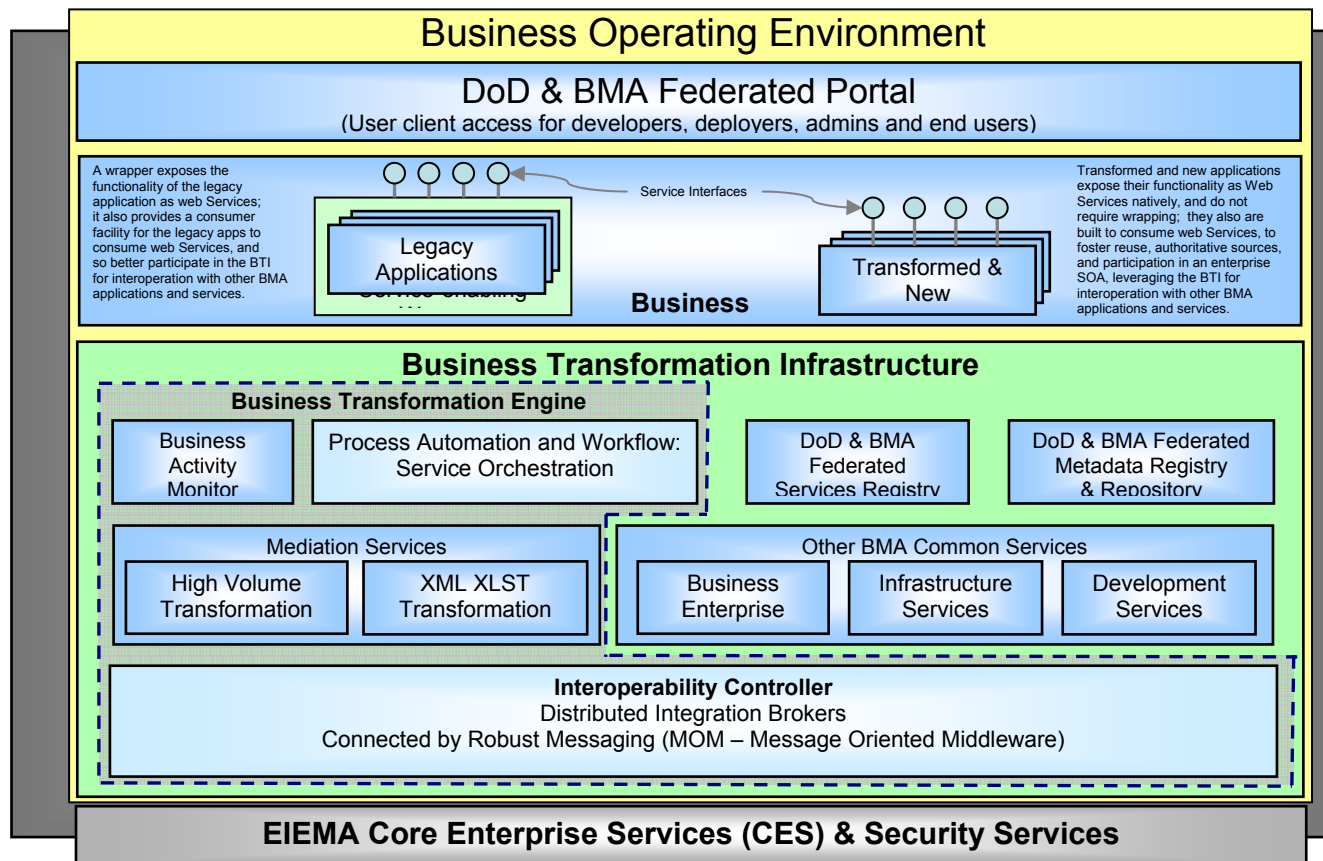


An overall depiction of the BOE and the BTI is presented in Figure 6, The BTI within the BOE. DoD business information moves to and from end-users and enterprise and Component applications. The movement is accomplished via web-based Graphical User Interface (GUI) facilities. The entry point and coordination are provided by the federated DoD and BMA portals in which the capabilities accessible through the BMA portal can be embedded as portlets in other DoD portals. Users will have access to shared information published to shared spaces, through enterprise information visibility applications. These applications also provide access to information through web Services exposed by applications and systems for purposes of information visibility. Both the portal facilities and the various BMA applications and systems will use the BTI for interoperation and interconnection.

Through the use of common services, EIEMA and the BMA/BTI will also provide for effective communication and interoperation with partner military organizations such as Allied and North Atlantic Treaty Organization (NATO) systems. Examples of the common services are:

- Metadata and BMA-standard ontologies
- Standard message sets
- Mediation and messaging
- Exposure of standards-based web Services

Through EIEMA capabilities and the BMA/BTI, the BMA will be able to participate in business processes that span DoD and partner military organizations. In this way the BMA can support advanced implementation of coalition Business Capability automation.



**Figure 6, The BTI within the BOE**

The components of Figure 6, The BTI within the BOE are described in the following paragraphs.

### **3.6.1. Business Operating Environment (BOE)**

The Business Operating Environment (BOE) is the IT ecosystem of the Business Mission Area. It includes common facilities such as the Portal, the business applications and services, and the common enabling and empowering infrastructure that is termed the Business Transformation Infrastructure (BTI). The BOE as part of the GIG, builds on and leverages EIEMA capabilities.

### ***3.6.2. DoD and BMA Federated Portal***

The Portal serves as the entry point to the computing environment and may be realized through the BMA portal, the DoD or Net Centric Enterprise Services (NCES) Defense Online, or other portal needed by a Component/function. The Portal is the primary search and navigation vehicle across the various facilities available to them in a Web environment. It ties together the Web client interfaces of those applications.

The BMA Portal is a web-browser accessible tool that provides users access to BMA applications and facilities. It will provide access to DoD Software as a Service (SaaS) facilities such as the CES Collaboration Service, and the federated GIG content, data asset and SaaS search and discovery services. Over time, there will be a wide range of facilities available to BMA users, such as personalization, real-time dashboards, Really Simple Syndication (RSS) and other subscription-based news feeds. Additionally, standard business and productivity applications required for people to carry out their regular work will be made available.

The DoD Portal provides a single point of entry for all DoD users, using Common Access Card-based authentication for single sign-on, and policy-based security enforcement. It will provide users access to services as a web browser.

### ***3.6.3. Business Applications***

The business applications are the main carriers of business function and process automation. As shown in Figure 6, The BTI within the BOE, applications can be categorized in two broad groups. The first group consists of legacy applications, which have not (and may never be) transformed technically and do not directly support the technology required to take advantage of the SOA infrastructure. The second group consists of those new applications built for SOA and existing applications that have been transformed to work in a SOA.

Legacy applications that provide important capability to the mission area can be adapted to this strategy through external means. A wrapper exposes the functionality of the legacy application as web Services. It also provides a consumer facility for the legacy applications to consume web Services and therefore interoperate with other BMA applications and services through this infrastructure.

Transformed and new applications natively expose their functionality as web Services and do not require wrapping. They are built to consume web Services, foster reuse, support use of authoritative sources, and participate in an enterprise SOA. They will leverage the infrastructure laid out here for interoperation with other BMA applications and services.

### ***3.6.4. Business Transformation Infrastructure (BTI)***

The Business Transformation Infrastructure (BTI) is the infrastructure that supports and enables interoperation and interconnection of business systems, services, and applications. This includes Component applications that need to share information, expose functionality, or consume functionality across the enterprise.

#### ***3.6.4.1. Users of the BTI***

The direct users of the BTI are development environments used by BMA and BTA developers, and the BMA applications and services. This is in line with the standard industry notion that the components or services in a SOA are intended for machine consumption (as in W3C's Semantic Web Initiative). For many years to come, the BMA's applications may include legacy systems that must be "wrapped" in order to provide and consume BTI and other application services. These wrapped legacy applications will run along side transformed and new applications that make use of the BTI and SOA natively. In both cases, the Capabilities or functionality of the applications or systems are made available as registered services in the overall BMA SOA. Infrastructure level facilities from DoD Components are also software applications that interoperate with the BTI on behalf of Component systems.

#### ***3.6.4.2. Components of the BTI***

The BMA/BTI includes the following component Capabilities, many of which may be provided as EIEMA capabilities:



- *Services Registry* that provides developers and software applications lists of available machine/software services, both from the BTI and from other BMA applications. Registry information includes the interface definitions, parameters of invocation, and rules of engagement per the web Services Description Language (WSDL). The registry can also provide end users with a list of available web and portal applications, that is, services in the second sense noted above. The Services Registry provided by the NCES program may be used as the BTI Services Registry.
- *Metadata Registry and Repositories* that store the data catalog, the document and data schemas, policy, and other information needed to drive the services of the BTI. The DoD Metadata Registry foundation will be used as the BTI Metadata Registry.
- *Common BMA Services* for use by applications and other services:
  - *Business Enterprise Services* are those common business services that can provide value across all business applications such as Business Intelligence and Knowledge Management.
  - *Infrastructure Services* provide specific services involved in the operation and leveraging of the BTI by applications.
  - *Development Services* aid the developers and system administrators in design and deployment of applications and services within the BMA SOA.
- *Business Transformation Engine (BTE)* - a group of close-knit Capabilities that form the core of the SOA, the interoperability and interconnection support, for BMA applications and systems:
  - When the foundation infrastructure – the BTE with its Interoperability Controller and a base set of services – has been established and made operational, the services available in the BTI can be increased, depending on:
    - a certain set of infrastructure services provided by the selected products
    - the services available or to be available from the GIG
    - the type of services needed to meet BMA and DoD business requirements in terms of the needs of specific prioritized Business Capabilities and achieving information visibility
    - The need for addition to the infrastructure, such as:
      - Service Orchestration Services and Facilities to provide the process automation and workflow Capabilities of the infrastructure
      - Policy Enforcement Point (PEP) Services to automate and enforce Service Level Agreements
      - Additional Infrastructure Services that emerge from Pilots and other research.

The BTE is further described in the next section.

#### 3.6.4.3. Business Transformation Engine (BTE)

The core of the BTI is generically designated the BTE. The BTE is the central organizing facility of the BTI, providing the substrate that ties together both the services provided by and through the BTI, and the applications and systems of the BMA. This establishes the common foundation infrastructure for a Service-Oriented Architecture environment in order to realize the federation strategy. It provides infrastructure Capabilities in support of application interoperability and interconnection. The BTE can manifest itself as an integrated COTS product or as a collection of software tools working in a collaborative fashion. It includes a number of features common to current SOA infrastructures such as:

- Business Activity Monitoring Capabilities
- Service orchestration facilities
- Mediation and other common services
- An interoperability controller that manages the flow and transformation of messages through the SOA infrastructure, providing integration and messaging Capabilities.



#### 3.6.4.3.1. Business Activity Monitoring (BAM) Facility

This component of the BTE provides a capability to monitor business systems at the technical levels of transactions and performance. It also provides the ability to monitor more abstract business levels to determine how business operations are performing. It can alert appropriate personnel when a business process is encountering difficulty, even if all the underlying network and computing infrastructure are working well. BAM allows management to ensure that business operations work smoothly and to take appropriate corrective business action when they are not.

#### 3.6.4.3.2. Process Automation and Workflow through Service Orchestration

In order to marshal the various functional features found in systems and applications across the BMA — functionality exposed as services in a SOA — there is a need to provide a flexible and adaptable means to describe business processes in terms of the connection and interaction of these services and actions required of the business personnel responsible for those processes. This need is met through the facilities of the Process Automation and Workflow component of the BTE which provides Service Orchestration. Business personnel can use this capability to link services to create automated business processes and to create composite services that may themselves be used in higher level automated business processes.

#### 3.6.4.3.3. Mediation Services

These services make use of metadata and rules to provide the ability to translate and validate information sent through the BOE. Some engines that perform mediation work at the message level, such as eXtensible Stylesheet Language Transformation (XSLT) engines. Others work at the data set level. Such facilities promote data interoperability throughout the BMA without requiring change or update to existing systems and applications, or changes to existing DoD Component infrastructures.

#### 3.6.4.3.4. Interoperability Controller

Just as the BTE is the central organizing facility of the BTI, the Interoperability Controller is the central organizing component of the BTE. It provides the foundation for the BTE through distributed integration brokers, connected by robust messaging that enables a scalable integration environment and control of the various aspects of interoperability operations within the BOE. It is also an architectural level description of the central capability of the BTE. This architecture can be implemented with open standards-based approaches, using a variety of COTS products, both commercial and open source.

#### 3.6.4.4. Information Assurance and EIEMA Security Services

Security Services are leveraged from the EIEMA CES in order to authenticate and provide security across the users and information of the BMA. These services are part of a broader, policy and best practices-based Information Assurance capability throughout the GIG. The Security CES, which should be a prerequisite for any net-centric operation on the GIG, and is necessary for the operation of BMA services, the BMA Portal and other DoD Portals.

#### 3.6.4.5. EIEMA Core Enterprise Services

Core Enterprise Services will be used throughout the Business Mission Area. For instance, the needed Message-Oriented Middleware infrastructure called for in the Interoperability Controller can be provided by the Messaging CES depending on how the BTE is acquired and implemented. Also, as noted earlier in 3.1.2, some CES require that Mission Areas and Components provide capability for the service in a federated, recursive fashion. If the primary CES were a search service, it would be designed to invoke Mission Area and Component search services across the information for which each organization has responsibility. The full service consists of the CES plus the federated services that provide the full reach of the service. The BTA will provide such extensions in the BTI in order to ensure that the given CES is properly incorporated and leveraged.

Initial implementation and configuration of the BTI and BTE will identify those EIEMA CES that are of immediate use and importance in the early increments of infrastructure development and use. This effort determines the priorities for those CES by the BTI. It establishes the rules of engagement with GIG services for BMA applications using EIEMA or BTI services, for BTI services and the BTE.





### ***3.6.5. Prioritize and Connect to the BTI***

The benefits of systems federation via the BTI are realized only when systems, applications, and services are connected or “plugged in” to it. As BMA leadership determines the priorities for business transformation activities, the prioritization will drive connection to the BTI. Systems, services, and applications will be hosted on the BTI in response to the prioritized Business Capabilities outlined in the ETP. It is the combination of Business Capabilities and the infrastructure requirements they dictate that will determine the development increments of BTI and its connections.

In building the BTI, standards and protocols will be defined so that members of the BMA will have clear guidance on how connection can be accomplished. Depending on the participating member, it may make sense to connect directly to the BTI or to connect via another infrastructure. Both are options as long as the standards and interconnection protocols are followed. Connecting to the BTI is accomplished at two levels: 1) individual enterprise or Component applications may connect to the BTI, or 2) Component infrastructures may be interconnected with the BTI.

### ***3.6.6. Connecting Applications***

In order to interoperate within the BTI, any application, service, or system must follow the protocols and standards published by the Enterprise. These include:

- Use of mediation to the standard message sets defined for the application functional area
- Use of services available through EIEMA or the BMA/BTI by discovering their interfaces in the service registry
- Definition and registration of a service for business functionality of priority to the enterprise
- Definition and registration of a service for accessing any source of data of priority to the enterprise
- Registration of any additional data asset catalogs or service registries with the BTI to enable federation of search and discovery

The preferred mechanism for direct connection is through the use of standards-based web Services facilities. Connection to the BTE may also be made through adaptors to integrate and leverage the Capabilities of legacy systems. This allows participation in the BTI without requiring changes to system configurations.

### ***3.6.7. Connecting Infrastructures***

The BTI enables a federation of the enterprise business infrastructure. Components with appropriate infrastructures tying together their applications and systems might connect to the BTI at the infrastructure level. Components may still implement their infrastructure according to their local requirements, with the addition that they be able to plug into the BTI in accordance with the defined standards for messaging and protocols. Through such a connection, they allow their applications to communicate with and provide services to other applications connected to the BTI.

It is not a part of this approach that Components establish an additional internal infrastructure or that they implement a particular infrastructure. Provided that Components can connect to the BTI via standards prescribed by the Enterprise, there is no additional requirement on Components to construct their internal infrastructures in any particular way.

## **3.7. Governing the BOE and BTI**

Through its services, the BOE will enable delivery of the capabilities and priorities established by the DBSMC and IRBs. In this manner, it serves as a technical delivery mechanism for delivering automated functionality to and from systems and users across the GIG. As such, the BOE plays an important role in the DBSMC / IRB decision making process regarding optimal solutions for Departmental business capability needs. To properly fill this role and ensure effective and efficient operations, the BOE will require the establishment, monitoring and enforcement of appropriate policies, standards and procedures. Thus, a BOE governance structure will be required to address these issues as well as to adjudicate conflicts between various BMA stakeholders and to integrate BOE activities with the enterprise-wide activities. Table 2, Governance Requirements for Systems Federation, sets forth the items that need to be addressed through governance to realize the benefits of the systems federation.



**Table 2, Governance Requirements for Systems Federation**

Category	Governance Requirement
<b>Policies</b>	<p>Establish policies for ensuring that shared services and data are sufficiently documented to:</p> <ul style="list-style-type: none"> <li>• Enable the automation of mediation and translation of data between interfaces.</li> <li>• Help potential service and data providers determine what to make available to the enterprise as services and supporting data standards and message sets.</li> <li>• Help potential consumers comprehend structural and semantic meanings of data and determine how to use it appropriately.</li> <li>• Help consumers identify authoritative data.</li> <li>• Establish policies for ensuring that shared services and data are appropriately resourced to support demand.</li> <li>• Establish processes for accommodating increased usage of shared services and data as a result of unanticipated users.</li> </ul>
<b>Incentives and Metrics</b>	<p>Establish the incentives and metrics that will be used to encourage and monitor:</p> <ul style="list-style-type: none"> <li>• Development and publishing of semantic and discovery metadata.</li> <li>• Use of IT services including CES, BMA Common Services, and other transformed application services.</li> <li>• Responsiveness to new end user data and application needs.</li> </ul>
<b>Data Management Processes</b>	<p>Define the processes for making changes to:</p> <ul style="list-style-type: none"> <li>• BMA metadata, services interfaces and service capabilities.</li> <li>• The semantic among data definitions.</li> </ul> <p>Define the processes for:</p> <ul style="list-style-type: none"> <li>• Identification, prioritization, ownership assignment, and definition of Authoritative Sources for publication according to the enterprise publication policy.</li> <li>• Registering metadata in a metadata catalog and posting metadata to those catalogs within the shared space.</li> <li>• Registering services in the BTI and managing any changes to that metadata.</li> </ul>
<b>Service Management Processes</b>	<p>Define the processes for:</p> <ul style="list-style-type: none"> <li>• Identifying and prioritizing BTI Services implementation</li> <li>• Wrapping Legacy application functions to expose services in the Business Operating Environment.</li> <li>• Making changes to BTI Services so that those changes do not adversely affect other applications or services that use the services. This includes retiring BMA infrastructure services, as well as making changes to active BMA infrastructure services.</li> <li>• Automating the management of Service Level Agreements.</li> </ul>

Category	Governance Requirement
<b>Quality Management Processes</b>	<p>Define the processes for:</p> <ul style="list-style-type: none"> <li>• Ensuring the quality and accuracy of the data and metadata posted to the shared space.</li> <li>• Creating and modifying metrics.</li> <li>• Testing and accrediting services</li> <li>• Evaluating and refining the end user experience within the BOE</li> </ul>
<b>Compliance Processes</b>	<p>Define the processes for ensuring that:</p> <ul style="list-style-type: none"> <li>• Metadata tagging guidelines adhere to the DoD Net-Centric Data Strategy. For example, the authoritative data source tagging must fit into the DDMS.</li> <li>• Services adhere properly to BMA/BTI and EIEMA standards. For example, Business Enterprise Services are registered and available through the Service Discovery CES.</li> <li>• The BMA members conform to BMA governance processes and the Federation Strategy.</li> <li>• Enterprise scalability for unanticipated users is included as a critical requirement in solution requirement and design review checklists.</li> </ul>





## 4. Federation Roadmap

Over the next year, DoD will move forward with the following steps for realizing the Federation Strategy:

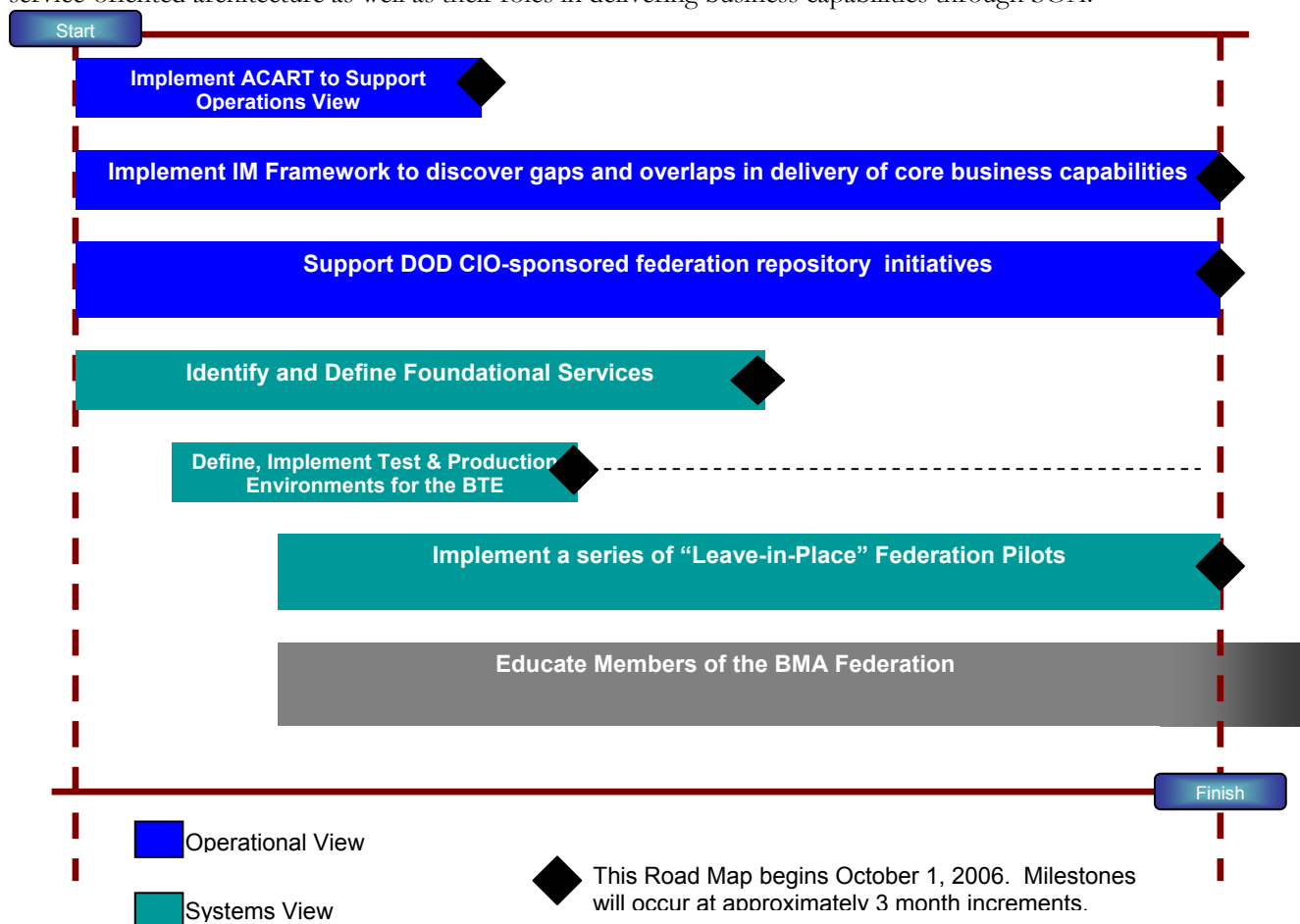
### Operational View Federation

- Support DoD CIO-sponsored federation repository initiatives which will provide common registration, search and discovery services across various DoD architectures
- Extend the IM Framework to assist in guiding the discovery of gaps and overlaps in the delivery of prioritized business capabilities
- Extend the Architecture Compliance and Requirements Traceability (ACART) tool to help guide BEA compliance determinations for investment review and to provide visibility of architectural alignment.

### Systems View Federation

- Implement a test environment, then a production environment for the Business Transformation Engine (BTE) to provide the necessary infrastructure for SOA.
- Implement a series of “Leave-in-Place” Federation Pilots to quickly begin leveraging value from the SOA – solving targeted integration problems and filling key capability gaps.
- Establish technical governance for BTI / BOE standards and capabilities

Educate stakeholders across DoD to make them aware of the principles and benefits of federation and service-oriented architecture as well as their roles in delivering business capabilities through SOA.



**Figure 7, High-Level Roadmap for Federation Strategy Implementation**

## **4.1. Support DoD CIO-sponsored federation repository initiatives**

EIEMA will be piloting a federated metadata discovery (search) capability across selected DoD architectures and repositories in a DoD Architecture Repository System (DARS). The search results will consist of records matching the search criteria and will contain as much of the architecture metadata as is available from confederate repositories. URLs in the reply metadata set will provide links to the source architectures in the confederate repositories. The BMA will participate in this effort.

## **4.2. Implement Investment Management Framework to Support Cross-Architectural Views of Capabilities**

The IM Framework is being piloted with the Defense Logistics Agency (DLA) in order to demonstrate how the Business Enterprise Priorities are being addressed comprehensively within the Defense Agencies. Components are currently in the process of detailing the mapping of their core systems to the BEA within the global business systems inventory. This will enable further refinement of the approach as it applies to BEP capability delivery across the Department

## **4.3. Implement ACART to Support BEA Compliance**

ACART Increment 1.0 was released by BTA on July 6, 2006 and included the Capabilities discussed in Section 2.4, BEA Compliance – The ACART Tool, such as the ability to track OV-5 node tree activities, activity control compliance, business rule compliance, and data compliance. Increment 2.0 will add additional functionality according to user requirements.

ACART will be deployed as a web tool accessible through the BTA Portal. Initially, ACART will provide a consistent mechanism for Components to demonstrate Operational View linkage between the BEA and both Component and Program Architectures. It is expected that ACART will also assist in the identification of gaps which will serve as requirements for future versions of the BEA.

## **4.4. Incrementally Build the BTE and Connect to Business Applications**

The BMA/BTE will leverage EIEMA core enterprise services including: Information Assurance (IA), Universal Description, Discovery, and Integration (UDDI), and the Metadata Registry (MDR) as well as the Global Information Grid (GIG). The BTI will enable interoperation and interconnection of business systems and applications when they need to exchange information by making information services visible, accessible and understandable across federation boundaries. In addition, the value-added services provided by the BTI, along with the standards and policies defined by the BTI and EIEMA for the GIG, provide the technical infrastructure needed to support an incremental implementation of the BTE and associated common services in the BTI. The following are the major steps in an incremental implementation of the BTE and associated common services in the BTI, as discussed in Section 3.6. The major items that will be covered during the incremental implementation are:

- Define standards for building the BTI and interoperating within the BOE,
- Acquire and deploy initial implementation of the BTE to support Leave-in-Place prototypes and development of the BMA Portal. This includes standing up the initial set of infrastructure services,
- Extend the BTI with additional common services and capabilities needed to meet specific DoD business requirements defined by the Business Enterprise Priorities (BEPs),
- Acquire or develop and deploy the BMA portal,
- Offer BMA services as portlets available through the DoD portal,



- Establish rules of engagement for use of EIEMA services into the BTI, negotiating service level agreements as necessary,
- Establish common developer services; this effort provides test versions of common infrastructure services to allow developers to test their work before connecting to the real services. The developer services may provide additional Capabilities such as the ability to vary the response of the service to determine how an application using the service will behave and respond in the face of varying performance and network conditions. Depending on more specific analysis, these services may include common storage and configuration management services for developers.

## 4.5. Conduct “Leave-in-Place” Federation Pilots

The BTA will schedule and implement multiple “Leave-in-Place” Federation Pilots during the next year to quickly begin leveraging value from the SOA solving targeted integration problems and filling key capability gaps. The purpose is to identify and conduct Pilots that, when completed, can offer services and capabilities proven beneficial toward the successful transformation of the DoD. Initial candidates include:

1. Interoperability Rules and Filter.
2. Interoperability Controller
3. Services Directory.
4. Centralized Funds Transfer.
5. DFAS Standard Disbursing Initiative (SDI)
6. End-to-End Business Activity Monitoring (BAM)

“TO BE” technical specifications and Business Cases will determine implementation schedule. Leveraging efforts currently underway will ensure that the prototypes can be put in place in 3 to 6 month time periods. All such pilots will, to the extent feasible during the pilot development, leverage and use the EIEMA CES. It is the intent of this strategy that the BTI be a principle means for business systems across the BMA to leverage and use the CES in a consistent manner.

During the course of the effort to build the BTI, close coordination with the “Leave-in-Place” Federation Pilot teams will ensure that the BTI provides needed foundation services and Capabilities in a timely fashion to support Pilot execution. This coordination will also ensure that common services that are developed as part of the “Leave-in-Place” Federation Pilots are brought into the BTI as appropriate.

## 4.6. Establish Governance for BOE / BTI

A governance infrastructure will be established and empowered to establish, monitor and police the policies, standards and procedures necessary for the operations of the BOE and BTI. This structure for BOE/BTI governance may leverage existing architecture governance structures and will work in partnership with other GIG governance structures. Options for the structure include a new review board to focus on systems federation requirements or an existing governance board may be able to address the requirements. Establishment of BOE/BTI governance must occur in parallel with the building of the BOE. In addition, the governance process needs to be integrated into the IRB process to ensure that investment decisions take into account the need to connect to the BTI to interoperate within the BOE.

## 4.7. Educate Stakeholders

In order to maximize the benefits of BMA Federation and its supporting environment, all stakeholders - Business Users, Component Leadership, Program Managers, and Developers - must be trained to understand how their work affects and is affected by federation and to leverage federation infrastructure most effectively. Curriculum will be developed for and delivered to each target stakeholder group over the next year. Topics that must be addressed in training are presented in Table 3, Curriculum needed by Users.



**Table 3, Curriculum needed by Users**

Curriculum: Educational Topics	Business Users	Component Leadership	Program Managers	Developers
Service-Oriented Architecture and Net-Centricity				Basics of SOA and Net-Centricity to include Data Sharing, Data Interoperability, Metadata and Services Registries, Services Orchestration, CES and Portals
Overall Federation Strategy	Makeup of the components of the BTI	Makeup of the components of the BTI	Makeup of the components of the BTI	Makeup of the components of the BTI
Business Transformation Infrastructure	Use of BTI components for discovery and use of services post-BTI implementation	How to evaluate transformation plans to drive the evolution of the BTI	Use of BTI services for integration into applications How to evaluate transformation plans to drive the evolution of the BTI	Use of BTI components for discovery, use of services (including EIEMA services), and creation of services upon BTI implementation
Business Activity Monitoring	Use of BAM tools to support day-to-day operations	Use of BAM tools to support management decisions		
Service Orchestration	Assembly and sequence of services to create new business processes from a business view			



# Appendix A: Acronym List

Acronym	Description
ACART	Architecture Compliance And Requirements Traceability
BAM	Business Activity Monitor
BEA	Business Enterprise Architecture
BEP	Business Enterprise Priority
BMA	Business Mission Area
BOE	Business Operating Environment
BPEL	Business Process Execution Language
BTAA	Business Transformation Agency
BTE	Business Transformation Engine
BTG	Business Transformation Guidance
BTI	Business Transformation Infrastructure
CBM	Core Business Mission
CES	Core Enterprise Service
CIO	Chief Information Officer
COTS	Commercial-Off-The-Shelf
DARS	Defense Architecture Registry System
DBSMC	Defense Business Systems Management Committee
DDMS	DoD Discovery Metadata Specification
DIMA	Defense portion of Intelligence Mission Area
DISA	Defense Information Systems Agency
DISR	Defense Information Standards Registry
DITPR	Defense Information Technology Portfolio Repository
DLA	Defense Logistics Agency
DoD	Department of Defense
DoDAF	DoD Architecture Framework
DoDD	Department of Defense Directive
EA	Enterprise Architecture
EFT	Electronic Funds Transfer
EIEMA	Enterprise Information Environment Mission Area
ESB	Enterprise Services Bus
ETL	Extract, Transform, Load
ETP	Enterprise Transition Plan
FMS	Foreign Military Sales
GCSS	Global Combat Support System



GIG	Global Information Grid
GIG CES	GIG Core Enterprise Services
GUI	Graphical User Interface
IA	Information Assurance
IER	Information Exchange Requirement
IM	Investment Management
IRB	Investment Review Board
IT	Information Technology
LRP	Laws, Regulations and Policies
MDR	MetaData Registry
MOM	Message-Oriented Middleware
NAF	Non-Appropriated Funds
NATO	North Atlantic Treaty Organization
NCES	Net-Centric Enterprise Services
NCOW RM	Net Centric Operations & Warfare Reference Model
NCOW RM TTV	Net Centric Operations & Warfare Reference Model Target Technical View
NDAA	National Defense Authorization Act
OAGIS BODS	Open Applications Group Integration Specification standard for Business Objects Documents
OSD	Office of the Secretary of Defense
OHIO	Only Handle Information Once
OV	Operational View
PC	Personal Computer
PCA	Pre-Certification Authority
PDA	Personal Digital Assistant
PEP	Policy Enforcement Point
PSA	Principal Staff Assistant
PM	Program Manager
RSS	Really Simple Syndication
SaaS	Software as a Service
SDI	Standard Disbursing Initiative
SFIS	Standard Financial Information Structure
SOA	Service-Oriented Architecture
SOAP	Simple Object Access Protocol (According to W3C this acronym is no longer valid but there is no replacement. The accepted term is SOAP)
SV	Systems View
TA	Tiered Accountability
TV	Technical View
UDDI	Universal Description Discovery and Integration
UID	Unique Identifier



USD AT&L	Under Secretary of Defense for Acquisition, Technology and Logistics
USSGL	United States Standard General Ledger
W3C	World Wide Web Consortium
WCF	Working Capital Fund
WMA	Warfighter Mission Area
WSDL	Web Services Description Language
XML	eXtensible Markup Language
XSLT	eXtensible Stylesheet Language Transformations



## Appendix B: Definition of Terms

Term	Definition
Application	A loosely defined subclass of computer software that employs the capabilities of a computer directly to a task that the user wishes to perform. (Source: Wikipedia, The Free Encyclopedia)
Authoritative Source	The source of data that is designated as the definitive source of the data, whether through law and regulation, or through enterprise and community decisions as to what source should be taken as ground truth (and for what purposes or audiences).
Business Capability	The ability to execute a specific course of action. It can be a single business enabler or a combination of business enablers (e.g., business processes, policies, people, tools, or systems information) that assist an organization in delivering value to its customer.
Business Enterprise Architecture	A blueprint to guide and constrain investments in DoD organizations, operations, and systems as they relate to or impact business operations. It will provide the basis for the planning, development, and implementation of business management systems that comply with Federal mandates and requirements and will produce accurate, reliable, timely, and compliant information for DoD staff.
Business Enterprise Priority	An area where transformed business operations will provide improved warfighter support, reduced costs, and better regulatory compliance. A BEP is formulated based on requirements identified by the warfighter, the Components, and the BTA. Initial priorities are: 1) <i>Personnel Visibility</i> 4) <i>Materiel Visibility</i> 2) <i>Acquisition Visibility</i> 5) <i>Real Property Accountability</i> 3) <i>Common Supplier Engagement</i> 6) <i>Financial Visibility</i>
Business Mission Area (BMA)	The role of the BMA is to deliver products and services required by the WMA to accomplish assigned objectives. The Global Information Grid (GIG) Architecture identifies four interdependent entities, or Mission Areas, within the DoD Enterprise Architecture. These Mission Areas are Warfighting (WMA), Business (BMA), DoD portion of Intelligence (DIMA), and Enterprise Information Environment (EIEMA).
Business Operating Environment (BOE)	The Business Operating Environment (BOE) is the entire IT ecosystem of the Business Mission Area. It includes common facilities like the Portal, the business applications and services, and the common enabling and empowering infrastructure that is termed the Business Transformation Infrastructure (BTI).
Business Transformation Engine (BTE)	The BTE is the central organizing facility of the BTI, providing the substrate that ties together both the services provided by and through the BTI, and the applications and systems of the BMA.
Business Transformation Infrastructure (BTI)	The Business Transformation Infrastructure (BTI) is the enabling infrastructure that supports and enables interoperation and interconnection of business systems and applications, including Component applications that need to do the following across federation boundaries: exchange information, expose functionality, or consume functionality.
Certification Authority	The designated PSA with responsibility for review, approval, and oversight of the planning, design, acquisition, deployment, operation, maintenance, and modernization of Defense business systems. Primary authorities for certification of the system are: USD (P&R) – Under Secretary of Defense (Personnel & Readiness) USD (AT&L) – USD (Acquisition, Technology & Logistics) USD (C) (Comptroller) ASD (NII) – Assistant Secretary of Defense (Networks and Information Integration)
component	System element or constituent.





Component	DoD service or agency.
Component Architecture	An architecture that reflects critical Component capabilities and can be used to instantiate compliance with those Component-specific requirements necessary to achieve transformation objectives.
Core Business Mission	A defined area of responsibility with functions and processes that provides end-to-end support to the warfighter.
Core Enterprise Services (CES)	IT services that provide the foundation for DoD service and data providers by delivering and managing the underlying capabilities from which communities build and receive the services they need to meet their business and information processing needs.
Defense Business Systems Management Committee	Chaired by the Deputy Secretary of Defense, the DBSMC is the highest authority providing top-level governance to coordinate Defense business system modernization and to link improvements in Business Capabilities to the warfighter. The DBSMC is composed of the Deputy Secretary of Defense, the Under Secretaries, and the Chairman of the Joint Chiefs of Staff (CJCS); the Secretaries of the Military Departments and the heads of the Defense Agencies, the Combatant Commanders of United States Transformation Command (USTRANSCOM) and Joint Forces Command; the Assistant Secretary of Defense for Networks and Information Integration/DoD Chief Information Officer (NII/CIO); and the Director of Program Analysis and Evaluation (PA&E) in an advisory role.
Enterprise Architecture	Enterprise Architecture is a strategic information asset base, which defines the business mission, the information necessary to perform the mission, the technologies necessary to perform the mission, and the transitional processes for implementing new technologies in response to the changing mission needs.
Enterprise Transition Plan	Designed to guide and track the business transformation of the DoD Business Mission Area. Includes activities associated with developing the plan and framework for moving from the “As Is” to the “To Be” using strategic plans, Business Capabilities, and architecture information. Key elements include the objectives, schedules, funding, and migration information for the systems and initiatives supporting DoD’s Business Enterprise Priorities.
Federated Architecture	An architecture that is composed of a set of coherent, but distinct, entity architectures; the architectures of the separate members of the federation
Federation	In a Federation, 2 or more parties agree to both remain 2 or more parties, and/or to work together according to precisely defined rules – this is in essence the underlying concept of a SOA
Global Information Grid	“The globally interconnected, end-to-end set of information capabilities, associated processes, and personnel for collecting, processing, storing, disseminating and managing information on demand to warfighters, policy makers, and support personnel. The GIG includes all owned and leased communications and computing systems and services, software (including applications), data, security services, and other associated services necessary to achieve Information Superiority. It also includes National Security Systems as defined in section 5142 of the Clinger-Cohen Act of 1996 (reference (b)). The GIG supports all Department of Defense, National Security, and related Intelligence Community missions and functions (strategic, operational, tactical, and business), in war and in peace. The GIG provides capabilities from all operating locations (bases, posts, camps, stations, facilities, mobile platforms, and deployed sites). The GIG provides interfaces to coalition, allied, and non-DoD users and systems.” (Source: DODD 8100.1).
Interoperability Controller	The central organizing component of the BTE. It provides the foundation—the distributed integration brokers connected by robust messaging— that provides the means for the BTI to provide a scalable integration environment and control various aspects of interoperability operations within the BMA.



Investment Review Board	A body established and chartered by the Certification Authorities (CAs) to provide investment review of the CAs business systems. Each IRB will assess modernization investments relative to their impact on end-to-end business process improvements that support warfighter needs. IRB membership includes representatives from the Components, Combatant Commands, and the Joint Chiefs of Staff.
IT Ecosystem	An IT community and its environment interacting and functioning as a unit.
Net-Centric	Exploitation of advancing technology that moves from an application centric <sup>5</sup> to a data-centric <sup>6</sup> paradigm – that is, providing users the ability to access applications and services through Web services – an information environment comprised of interoperable computing and communication components
Principal Staff Assistants	The Under Secretaries of Defense, the Director of Defense Research and Engineering, the Assistant Secretaries of Defense, the General Counsel of the Department of Defense, the Comptroller of the Department of Defense, the Assistants to the Secretary of Defense, and the OSD Directors or equivalents who report directly to the Secretary or Deputy Secretary of Defense. (Source: DoDD 5100.81, Department of Defense Support Activities (DSAs))
Program Architecture	Define operational, system, and technical requirements for the scope of a specific program of record.
Pre Certification Authority (PCA)	PCAs are responsible for assessing compliance with the BEA and the Component architectures, and for pre-certifying that those systems forwarded to the IRB for certification meet the conditions for certification.
Really Simple Syndication	A web standard for a Web content syndication format; it is an unusual standard, in that it is maintained by Harvard Law School.
Service-Oriented Architecture (SOA)	An architecture comprised of independent services and orchestration functionality to compose business processes from these and other services.
Tiered Accountability	An approach to business transformation that is based on dividing the planning and management of systems and initiatives between Enterprise and Component levels.

<sup>5</sup> Application-Centric – focusing on the application as the foundation or starting point. In an application-centric system, the program is loaded first, which in turn is used to create or edit a particular type of data structure.

<sup>6</sup> Data-Centric – focusing on the central design data repository as the foundation or starting point. In a data-centric system, the data is primary and services manipulate the data.

# Appendix C: Reference Documents

No.	Referenced Document	Date
1	<i>Business Enterprise Architecture</i>	15 March 2006 Version 3.1
2	<i>Business Enterprise Architecture (BEA) Compliance Guidance</i>	10 April 2006
3	<i>Business Mission Area (BMA) Net-Centric Strategy, Version 4.0</i>	29 March 2005, Version 4.0
4	<i>Business Transformation Guidance</i>	21 June 2006
5	<i>CJCS Manual 3170.01B, Operation of the Joint Capabilities Integration and Development System</i>	11 May 2005,
6	<i>Department of Defense Discovery Metadata Specification (DDMS)</i>	29 July 2005, Version 1.3
7	<i>Department of Defense Enterprise Transition Plan Volume 1: Defense Business Transformation Overview</i>	30 September 2005
8	<i>DoD Architecture Framework, Volume I, Volume II, and Volume III</i>	9 February 2004 Version 1.0
9	<i>DoD Directive 4630.5, Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)</i>	5 May 2004
10	<i>DOD EA Federation Strategy</i>	2006
11	<i>DoD Instruction 4630.8, Procedures for Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)</i>	30 June 2004
12	<i>DoD IT Business Systems Investment Certification and Annual Review Process User Guidance</i>	
13	<i>DoD Investment Review Process Overview and Concept of Operations for Investment Review Boards (IRB CONOPS)</i>	17 may 2005
14	<b>"The Net-Centric Enterprise Information Assurance (IA) Strategy Annex to the DoD IA Strategic Plan" April 26, 2006</b>	
15	<i>Government Computer News, DoD To build EA from the Ground Up, Dawn Onley, <a href="http://www.gcn.com/print/25_14/40918-1.html">http://www.gcn.com/print/25_14/40918-1.html</a></i>	5 June 2006
16	<i>Initial Capabilities Document (ICD) for BEA Implementation of the Architecture Compliance And Requirements Traceability (ACART) Capability</i>	7 June 2006
17	<i>Net Centric Operations &amp; Warfare Reference Model Target Technical View, Version 1.1</i>	October 2005
18	<i>Section 332, Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005</i>	2005
19	<i>Business Transformation Guidance (BTG)</i>	July 2006



# Appendix D: OV-5 Mapping Example

As discussed in Section 2.4 *BEA Compliance – The ACART Tool* and Section 2.5 *Gap – Capabilities Not Covered by the BEA*, Operational View federation pertains to the mapping of Component Enterprise and Program Architecture information to like information contained in the BEA. This mapping starts with the OV-5 Node Tree.

There are multiple possible outcomes when attempting to map to the BEA OV-5 Node Tree.

1. A Component or Program activity maps directly to an activity or activities of the BEA.
2. A Component or Program activity maps to an activity or activities of the BEA but the Program's sub-activities do not have mappings to the BEA.
3. A Component or Program activity and corresponding sub-activities do not map to the BEA but perform business functions that may apply to other Components or Programs.

Figure 8, BEA OV-5 Node Tree Mapping Example, is illustrative of each of these examples.

## Component/Program Activities Mapping Directly to the BEA

In this example, a Program analyzes its operational activities and finds that the BEA operational activities it supports are related to the Manage Acquisition Business Functional Areas activity. Within the Program's list of activities, it identifies that its activities map directly to three sub-activities of the BEA's Manage Acquisition Business Functional Areas activity. This is illustrated via the pink and green boxes with the bold red outlines. It is important to note that the Program activities do not have to have the same names or definitions as BEA activities to be mapped to those activities. When analyzing activities one needs to consider all elements of an activity (i.e., definition and ICOMs).

## Component/Program Sub-Activities not Mapping the BEA

In this example we use the same higher level BEA activities as above. Here the Program has concluded that the activities that it initially identified as mapping to the BEA have sub-activities that are not in the BEA. In this case, the mapping is still performed as described above but the Program's sub-activities do not have BEA equivalents. Through federation, the Program's sub-activities would still be displayed as part of the federation but as sub-activities of the Program-specific activities. In other words, for this Program to federate to the BEA it would map/align this portion of its activity hierarchy, exactly as it is structured within the Program architecture, to the appropriate higher level activity(s) of the BEA. This is illustrated via the pink and green boxes without the bold red highlights.

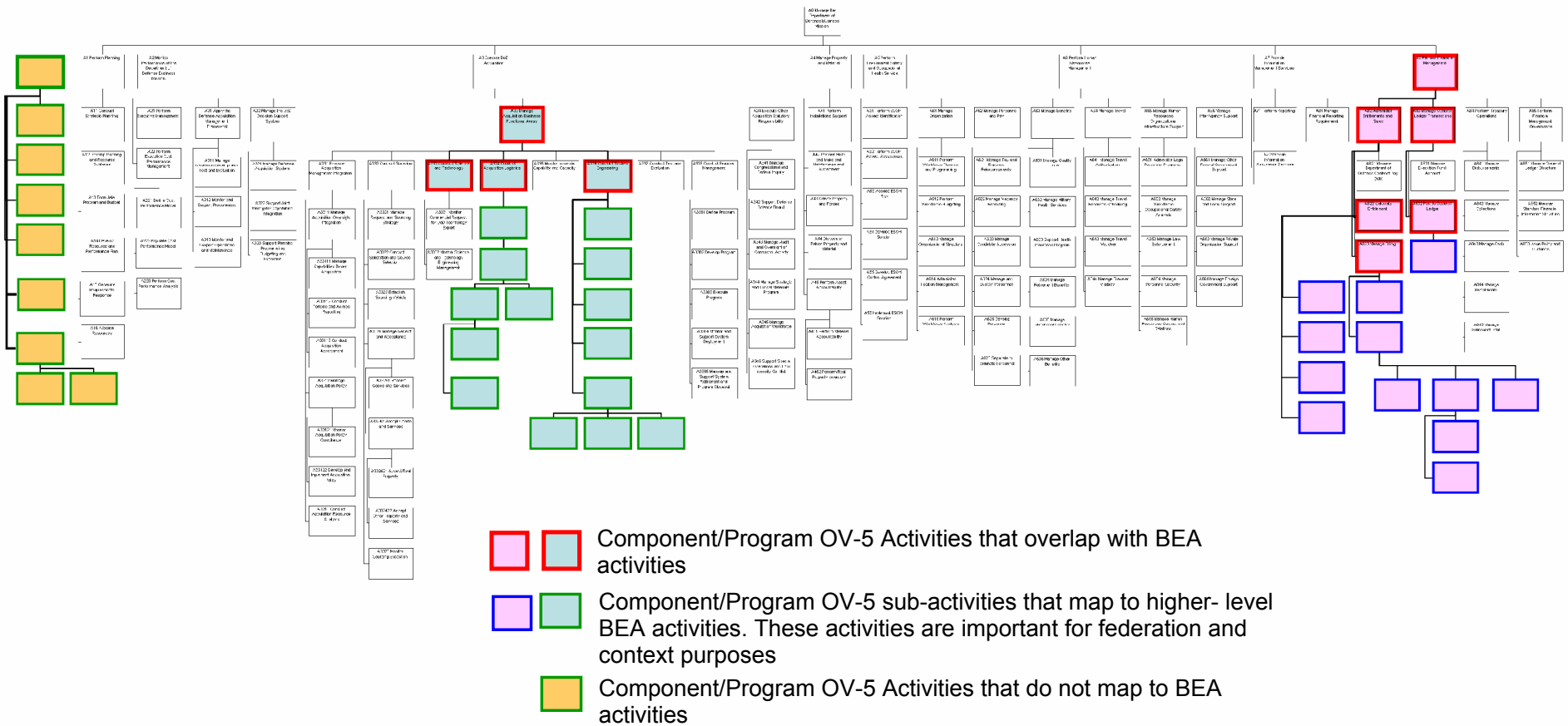
## Component/Program Activities Do Not Map to the BEA

This example directly relates to supporting gap identification and the ability to perform thorough cross-Component and cross-Program analysis. Here the Program concludes that its activities, after reviewing definitions and ICOMs, do not have functional equivalents in the BEA. This could be due to a variety of reasons to include, but not limited to, the following:

- The activities are part of a Business Enterprise Priority that has not been fully “fleshed out” in the BEA,
- The activities are actually outside the scope of the current BEA,
- The activities have not been deemed enterprise functions but are necessary for the BMA,

In this case, in order for the Federated Enterprise Architecture to be exemplary of the DoD Enterprise, it should include these types of activities in order for organizations that perform similar functions to be included in the federation. This example is illustrated via the orange boxes within Figure 8, BEA OV-5 Node Tree Mapping Example.





**Figure 8, BEA OV-5 Node Tree Mapping Example**